**SECOND DERIVATIVES INVOLVING PARAMETRIC EQUATIONS AND IMPLICIT DIFFERENTIATION**

**Example 1:** Find for the curve with and .

The rule for finding the second derivative of parametric equations is:

i.e. differentiate the first derivative () with respect to , then multiply it with .

* The first derivative is found using the chain rule: = 1
* Differentiate again with respect to :
* So

**Example 2:** Find of .

* Find the first derivative using implicit differentiation:
* Rearrange to make the subject:
* Since the first derivative is a quotient, i.e. or in this case here , we must use the quotient rule to differentiate, and also differentiate implicitly, to get the

second derivative.

* Quotient Rule:
* We need to substitute the term with and then simplify:

(from multiplying top and bottom by )

* Therefore .